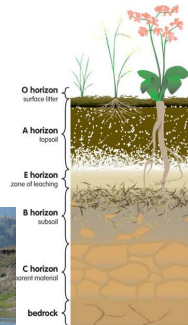


## 11/16 NOTES: SOIL – THE BASIS OF LIFE ON LAND



## Soil Erosion

- The transport of soil particles by wind, water, or gravity.
- Problem: it takes hundreds of years to form new soil!



## Physical Weathering

Frost-wedging (from ice)



Sea-arch (from waves) –  
weathering AND erosion



## Physical Erosion

Mass Wasting (gravity)

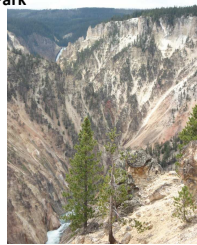


## Chemical Weathering

Alteration of minerals at Broad  
Pass, Alaska



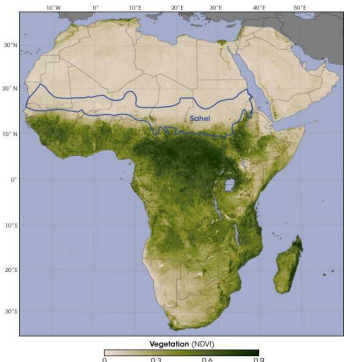
Inspiration Point,  
Yellowstone National  
Park



## Desertification

Desertification  
is the process  
by which  
land dries  
out

Video: Oases and  
Desertification (5  
mins)



## Salinization

- Salinization is the process by which soil become saltier and eventually fails to produce crops
- This is most urgently a problem when crops are being overwatered or where the soil does not easily let water infiltrate.



## Class Discussion: What happened with your plant growth?

- Correlation to soil size?
- Rank the soils in terms of BEST (1) to WORST (4) in terms of plant mass and height

## Soil Permeability

- Soil texture is the most important factor for nutrient and moisture availability. It is also a key factor in soil aeration which is a limiting factor for many desert plants.

Limiting factor: (or limiting resource) is the factor that controls how much a process occurs

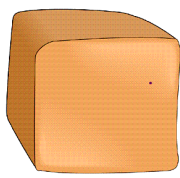
- Ex: sunlight in the rainforest; growth is limited to all plants in the understory unless more light becomes available. *If* more light becomes available, then more plants will grow. If more water becomes available, more plants will NOT grow. Therefore, water is not a limiting factor in that environment, whereas light is.
- Can you think of a limiting factor for plant growth in crop land of the mid-western US?

## I. Surface area

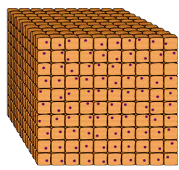
- A. For a given weight of sample, the smaller the particle, the greater the surface area.

Randy Moore, Dennis Clark, and Darrell Voloshin, Botany Visual Resource Library © 1998 The McGraw-Hill Companies, Inc. All rights reserved.

### Surface-to-Volume Ratio

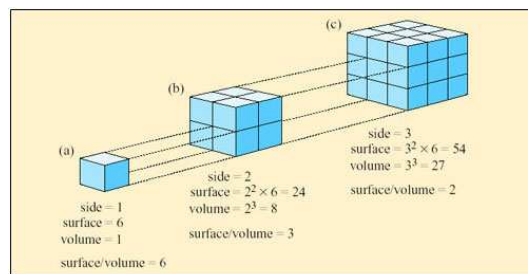


(a)



(b)

Surface area : Volume ratio  $\uparrow$  as sediment size  $\downarrow$



**B. Clays: Increased Surface Area causes:**

- 1) Increased chemical reactions: Clays exchange ions - Sands do not.
- 2) Increased water Retention: Clays have a very strong hold of water.
  - a) This means subsurface clays can be moist even after long droughts.
  - b) Only strong suction from a plant's roots can separate the water from clays.
- 3) Decrease aeration of roots. It is very important for some roots to get a good supply of air. Aeration is a limiting factor for the desert plants like creosote

**C. Sands: Increased Pore Size causes:**

- 1) Greater water flow rate: Sands pass water quickly- many plants with a surficial roots uptake water quickly also.
- 2) Greater evaporation: Sands do not hold onto the water. The plants with surficial roots can also retain the water in their tissues (cacti and succulents)
- 3) Increased aeration: Sands provide plenty of air in their pore spaces. (Ex. Creosotes are desert plants sensitive to soil air)

**Summary:**

- Sediments that are too large (like sand & gravel) do not hold on to water or nutrients long enough to provide them to plants
  - Very high percolation = not good for plants
- Clays hold on to water and nutrients too much to give them to plants
  - Very LOW percolation = not good for plants
- Topsoil and mixed soils provide a good balance
  - There is a surface area to volume ratio of soil that provides pore spaces *with just the right* percolation for different plants in different environments (Think of Goldilocks)